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The dynamics of risk in transition: Beta, behavior, and information in Indonesia's post-crisis stock market

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ABSTRACT

This study investigates how sectoral beta dynamics, investor behavior, and informational asymmetry shape equity returns in Indonesia's post-crisis capital market, characterized by volatility, retail dominance, and structural transitions. Employing panel regression across eleven sectors (2018–2025), we trace risk–return patterns over three regimes: pre-COVID, pandemic, and post-COVID recovery. Results reveal consistently positive and significant betas, yet crisis periods generate anomalies: low-beta sectors such as Agriculture and Property outperform high-beta counterparts. This divergence from classical CAPM expectations highlights the influence of retail herding and informational homogeneity. By integrating CAPM with behavioral finance and market microstructure perspectives, we construct a hybrid lens that captures both systematic risk and market psychology. The study contributes to ASEAN-focused scholarship in three ways. First, it empirically maps how sectoral betas adjust to regime shifts in a transitional economy. Second, it explains anomalous market movements through behavioral and informational mechanisms, advancing beyond traditional CAPM reasoning. Third, it offers policy-relevant insights by proposing a behavior-adjusted beta framework with implications for financial governance, investor literacy, and adaptive risk modeling. These findings underscore that equity pricing in emerging markets is shaped as much by psychology and information flows as by systematic risk, carrying lessons for Indonesia and comparable ASEAN economies.

Contribution/ Originality: This study is original in integrating sectoral beta dynamics with behavioral and informational dimensions across crisis and recovery regimes in Indonesia. Unlike prior CAPM-based analyses, it develops a behavior-adjusted beta framework that explains anomalous returns in retail-dominated markets and offers policy-relevant insights for ASEAN financial resilience.

1. INTRODUCTION

Indonesia's capital market is undergoing a paradigmatic transformation marked by structural, behavioral, and informational shifts. The confluence of macroeconomic shocks, digital financial access, and a dramatic rise in retail participation has redefined the contours of risk and return across sectors. By 2023, retail investor accounts on the Indonesian Stock Exchange (IDX) had exceeded 12.2 million, more than double the total in 2019 (Indonesia Central Securities Depository (KSEI), 2023).

This investor influx has not only deepened liquidity but also introduced behavioral volatility that challenges conventional asset pricing assumptions. These market-wide shifts have been particularly accentuated during systemic events such as the COVID-19 pandemic, during which volatility in the composite index surged to unprecedented levels.

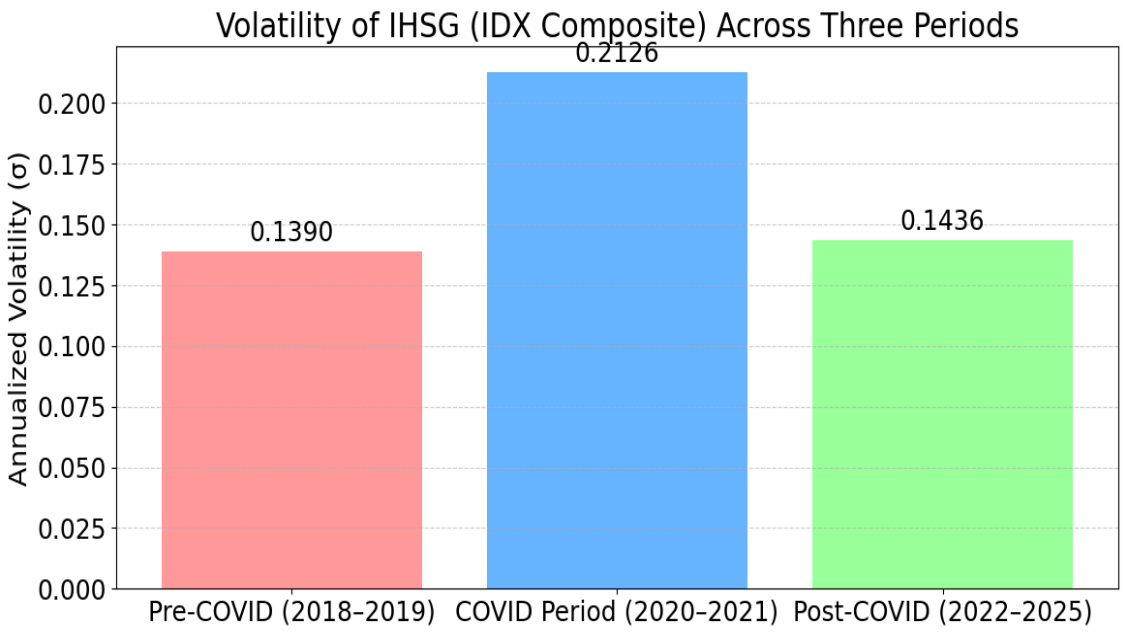

Figure 1. IHSG volatility across economic regimes.

Figure 1 demonstrates this volatility shock with clarity: from a relatively stable pre-COVID period (2018–2019) characterized by an annualized volatility of 13.9%, the market entered a heightened risk regime during the pandemic (2020–2021), where volatility spiked to over 21.2%. In the post-COVID recovery period (2022–2025), volatility moderated but remained slightly elevated at 14.4%, suggesting a structural recalibration of risk expectations.

Amid such turbulence, the concept of sectoral beta, defined as the sensitivity of sectoral returns to overall market movements, has become crucial. Under the standard Capital Asset Pricing Model (CAPM), beta functions as a proxy for systematic risk and posits a positive linear relationship with expected return (Sharpe, 1964). However, emerging empirical evidence from Indonesia suggests that this risk-return trade-off may be conditional rather than universal.

During the COVID-19 crisis, lower-beta sectors such as Agriculture and Property unexpectedly outperformed, while traditionally high-beta sectors such as Financials and Infrastructure underperformed sharply (OJK, 2022; Prasetyo, Haryanto, & Wijaya, 2024). These anomalies cast doubt on the stability of CAPM predictions in high-volatility, behavior-driven markets.

This empirical paradox prompts a deeper inquiry into three converging forces:

1. Behavioral evolution of a predominantly retail investor base driven by social media and short-term sentiment.
2. Informational asymmetry, characterized by homogeneous sources of news and low-quality financial literacy.
3. Regime sensitivity to macroeconomic indicators and policy stimuli (e.g., interest rates, inflation, fiscal supports).

Accordingly, this study seeks to investigate how systematic risk, investor behavior, and information asymmetry interact to shape investment outcomes in one of Southeast Asia's most dynamic and volatile capital markets. We focus specifically on sectoral dynamics, which are often underexplored compared to firm-level analyses.

1.1. Research Questions and Hypotheses

This study is designed to address these issues by exploring the following core research questions:

1. Do Indonesian sectoral betas demonstrate consistent and statistically significant sensitivity to market returns across different economic regimes pre-COVID, during COVID, and post-COVID recovery?

2. How do sectoral return patterns during crisis and recovery periods align or deviate from the high-risk–high-return hypothesis proposed by CAPM?
3. To what extent do investor behavior and informational homogeneity influence beta volatility and distort the beta-return relationship in Indonesia?

To address these questions, we formulate four hypotheses that will be tested empirically:

H_1: All sectoral betas are positive and significant, affirming a systemic linkage to overall market movements across all periods.

H_2: During the COVID-19 pandemic, low-beta sectors achieved higher returns than high-beta sectors, indicating a reversal of the traditional risk-return relationship.

H_3: In the post-COVID recovery period, high-beta sectors exhibited stronger return rebounds, validating a return to risk-aligned performance.

H_4: Retail investor behavior and informational homogeneity significantly amplify beta volatility and contribute to return anomalies across sectors.

This study contributes by mapping sectoral beta and return dynamics across crises and recoveries in Indonesia, integrating behavioral finance and information asymmetry into CAPM interpretation, and offering policy insights for improving financial literacy, diversifying market information, and tailoring adaptive portfolio strategies.

This study makes three interrelated contributions to the literature on sectoral risk in emerging capital markets.

First, it provides a regime-sensitive assessment of beta behavior across three distinct economic phases, offering a longitudinal perspective on how systematic risk fluctuates in response to crises and recoveries.

Second, it integrates behavioral and informational dimensions into the analysis of risk-return anomalies, addressing a critical gap in the conventional CAPM framework when applied to markets with high retail penetration.

Third, by situating Indonesia's experience within a broader ASEAN context, the study proposes a replicable framework for understanding how digital inclusion, information concentration, and investor sentiment jointly influence price dynamics. Together, these contributions advance a more contextualized and policy-relevant understanding of financial risk in Southeast Asia.

2. LITERATURE REVIEW AND THEORETICAL DISCUSSION

2.1. Sectoral Risk and Beta Dynamics in Emerging Markets

The beta coefficient, introduced in the Capital Asset Pricing Model (CAPM) by Sharpe (1964) remains one of the most widely used indicators of systematic risk, particularly in assessing sector-level vulnerability to macroeconomic shocks. In mature markets, beta typically conforms to the high-risk–high-return expectation, where a $\beta > 1$ signals greater volatility and, consequently, the potential for higher returns. However, in emerging markets such as Indonesia, sectoral beta demonstrates more complex and often inconsistent behavior (Hartono & Wibowo, 2022; Zhang, Lee, & Robinson, 2022).

Research has shown that sectoral beta in emerging economies is not solely driven by market fundamentals but also influenced by global commodity prices, policy shocks, and investor sentiment. For example, Gonzalez and Reyes (2024) observe that the Indonesian mining and infrastructure sectors tend to exhibit elevated beta volatility in response to global energy and commodity cycles. These findings align with earlier work by Kim and Wang (2023) who argue that sectoral betas in frontier markets are more path-dependent and context-sensitive than their counterparts in developed financial systems.

In addition, sector beta is found to be time-varying. Using multi-period models, Zhou, Lim, and Lee (2023) and Wong and Siew (2021) show that beta values fluctuate across economic regimes, suggesting that cross-sectoral capital sensitivity must be analyzed dynamically rather than statically. These results lend empirical support to our

first hypothesis (H1) that sectoral betas in Indonesia are positive and significant but evolve over time in response to macroeconomic and structural conditions.

2.2. Crisis-Induced Risk–Return Reversal and the Role of Policy

One of the most salient challenges to CAPM in recent years has been the observation of return reversals during economic crises. In theory, investors should demand higher returns for accepting higher beta risk (Lintner, 1965; Mossin, 1966).

However, this equilibrium breaks down under systemic shocks such as the COVID-19 pandemic. Lee and Park (2022) examined South Korean markets during 2020–2021, and it was found that investors abandoned high-beta equities in favor of low-volatility defensive sectors. Similar behavior was reported in India (Verma & Jain, 2024), where capital flowed into essential industries like agriculture and pharmaceuticals, diverging from CAPM expectations.

These findings are echoed in the Indonesian context. Prasetyo et al. (2024) report that sectors with traditionally low beta, including Agriculture and Property, outperformed high-beta sectors such as Financials and Mining during the COVID-19 shock.

This anomaly is attributed to investor shifts toward capital preservation, influenced by uncertainty, fiscal incentives, and the psychological salience of essential goods. Cheng, Zhang, and Lee (2023) further argue that during crises, utility functions pivot from risk-neutral maximization to loss minimization, challenging CAPM's static risk-return assumption.

These studies directly inform our second hypothesis (H2), suggesting that Indonesia's sectoral returns during COVID-19 deviated from the expected beta-return linearity, with low-beta sectors outperforming high-beta ones.

2.3. Post-Crisis Beta Rebound and Economic Normalization

Conversely, the post-pandemic period offers an opportunity to test whether the classical CAPM logic resumes once economic uncertainty recedes. The beta-rotation strategy proposed by Ramirez and Nguyen (2023) suggests that during recovery periods, capital flows back into high-beta sectors as investor confidence returns and macroeconomic indicators improve. In the Eurozone context, Santos and Ferreira (2024) found that high-beta portfolios significantly outperformed during post-crisis periods, validating CAPM under stabilizing conditions.

Empirical evidence from Indonesia shows a similar pattern. The Mining, Financials, and Basic Industry sectors, traditionally high-beta, have experienced substantial performance recovery during 2022–2023, driven by export booms and infrastructure investments (Indonesia Stock Exchange (IDX), 2023; Trade Ministry Republic of Indonesia, 2023).

These dynamics support our third hypothesis (H3) that high-beta sectors rebounded more strongly during the post-COVID period, affirming the return of beta as a useful predictive tool under normalized conditions.

2.4. Behavioral Finance and Investor Psychology in Emerging Markets

The rapid rise in retail investors, especially millennials and Gen Z participants, has shifted the behavioral landscape of Indonesia's capital market. Unlike institutional investors who follow formal strategies, retail traders are more prone to cognitive biases, herd behavior, and overreaction to news (Suryanto, Prabowo, & Hartini, 2023; Tahir & Danarsari, 2023). These biases intensify during crises and contribute to synchronized market actions, exacerbating volatility.

Bikhchandani, Hirshleifer, and Welch (1992) introduced the concept of informational cascades, wherein individuals mimic the actions of others despite private information. In a similar vein, Odean (1998) and Shiller (2000) highlight overconfidence and "irrational exuberance" as key factors driving speculative surges and asset

mispricing. In Indonesia, the influence of online influencers, limited financial literacy, and gamified trading apps have amplified such effects (Alamsyah & Hidayat, 2023; Prabowo, Nugroho, & Santoso, 2023).

These patterns distort the predictive capacity of beta and contribute to return anomalies, particularly in sectors that receive excessive retail attention. This contextual insight supports hypothesis H4: that behavioral convergence and informational homogeneity amplify beta volatility and undermine the risk-return relationship.

2.5. Informational Homogeneity and Market Fragility

Efficient market theory posits that all available information is already reflected in asset prices (Fama, 1970). Wijaya and Setiawan (2022) found that most Indonesian retail investors rely on IDX reports, limited analyst coverage, and social media trends, creating an "echo chamber" effect.

This phenomenon reduces market depth and increases fragility. When most participants react to the same stimuli simultaneously, even minor news events can trigger outsized price movements. (Rahadi, Nugroho, & Santoso, 2023) and Fathoni, Nugroho, and Pratama (2023) emphasize the need for expanding independent research coverage and improving financial journalism as mechanisms to enhance market resilience and investor rationality.

The link between informational structure and market volatility further validates hypothesis H4. Behavioral convergence, when combined with information monoculture, becomes a powerful force that disrupts classical asset pricing and justifies the use of enriched hybrid models.

2.6. Toward a Hybrid Asset Pricing Framework

These findings compel a rethinking of beta as not merely a statistical coefficient but as a behavioral and structural signal. The Arbitrage Pricing Theory (APT) proposed by Ross (1976) offers a more flexible model that allows multiple risk factors, macroeconomic, psychological, and informational.

Recent empirical extensions include sentiment-adjusted beta models (Yusuf & Chandra, 2025) and low-volatility investing frameworks (Cheng & Anwar, 2023; Santos & Ferreira, 2024), both of which outperform static CAPM under turbulent conditions.

Therefore, a hybrid theoretical framework that blends traditional CAPM, behavioral finance, and information economics is necessary for explaining sectoral return dynamics in Indonesia. The study adopts this integrative perspective to interpret the empirical results and policy implications presented in the following sections.

3. CONCEPTUAL FRAMEWORK AND METHODOLOGY

3.1. Conceptual Framework

The conceptual framework guiding this study integrates traditional asset pricing logic with behavioral and informational dimensions, reflecting the dynamic nature of emerging market structures such as Indonesia. At its core, the model builds upon the foundational Capital Asset Pricing Model (CAPM), which posits that expected returns are a linear function of systematic risk, as captured by the beta coefficient (Sharpe, 1964). However, drawing from the empirical deviations identified during the COVID-19 pandemic and subsequent recovery, this framework expands to incorporate behavioral and informational modifiers that affect sectoral beta volatility and return patterns.

The framework consists of three interacting dimensions:

1. Sectoral Beta Volatility: Defined as the sensitivity of sectoral returns to market-wide movements, beta is theorized to vary across time due to macroeconomic shifts, policy stimuli, and exogenous shocks. Sectors such as Financials and Infrastructure, which are more cyclical, are expected to exhibit higher beta in periods of economic expansion and more vulnerability during crisis periods (Gonzalez & Reyes, 2024; Zhang et al., 2022).

2. Investor Behavior: Retail participation in the Indonesian stock market has surged over the past five years, driven by increased digital access and fintech innovations (Indonesia Central Securities Depository (KSEI), 2023). This demographic shift has introduced behavioral anomalies such as herding, overreaction, and sentiment-driven trading into asset pricing processes. These behaviors are theorized to distort the beta–return relationship, particularly under conditions of uncertainty or crisis (Prabowo et al., 2023; Tahir & Danarsari, 2023).
3. Informational Homogeneity: The concentration of retail investor reliance on a limited set of information sources such as IDX press releases, financial influencers, and algorithmically curated news feeds contributes to synchronized trading decisions. This "informational echo chamber" (Wijaya & Setiawan, 2022) weakens the market's interpretive diversity, leading to collective action bias and price overreaction, particularly in sectors that receive heightened attention (Rahadi et al., 2023).

These three dimensions are situated within three distinct time regimes pre-COVID (2018–2019), COVID crisis (2020–2021), and post-COVID recovery (2022–2025), allowing for dynamic temporal analysis. The conceptual model is illustrated in [Figure 1], mapping the interactions between systemic risk (β), behavioral influences (ψ), and informational structure (φ), each hypothesized to influence sectoral return ($R_i t$) over time.

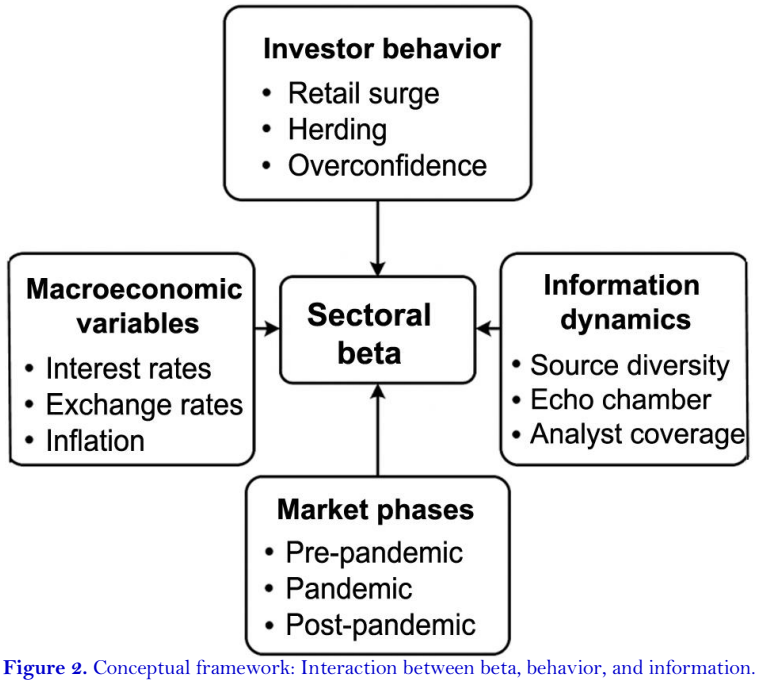

Figure 2. Conceptual framework: Interaction between beta, behavior, and information.

Figure 2 illustrates the study's conceptual framework, which integrates sectoral beta, investor behavior, and informational homogeneity into a hybrid model of risk–return dynamics. The figure depicts how beta (systematic risk) interacts with behavioral influences (ψ) and informational structures (φ) across three distinct regimes: pre-COVID, during the pandemic, and post-COVID recovery. By visualizing these interconnections, Figure 2 emphasizes that sectoral returns ($R_i t$) are not solely determined by systematic risk, but are also shaped by investor psychology and informational concentration, particularly in transitional markets such as Indonesia.

3.2. Empirical Model

To empirically test the four hypotheses derived from the framework, a modified Single Index Model (SIM) regression is employed. This specification allows for both time-invariant beta estimation and the detection of period-specific structural shifts using dummy variables.

The model is specified as follows:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \gamma_{1i} D_{COVID_t} + \gamma_{2i} D_{PostCOVID_t} + \varepsilon_{it} \quad (1)$$

Where:

- R_{it}: Return on sector i in time period t.
- R_{m_t} : Return of market index (JCI) in time period t.
- D_{COVID_t}: Dummy for Covid Period (Before 2019-2021).
- $D_{PostCOVID_t}$: Dummy for Post-COVID Period (after 2021).
- α_i: Constant term (intercept).
- β_i: Beta coefficient for sector i.
- γ_{1i} and γ_{2i}: Coefficients of Dummies.
- ε_{it}: Error term (Random disturbance).

This model facilitates the evaluation of both:

- H1 (Beta significance): via β_i.
- H2 (COVID shift in returns): via γ_{1i}.
- H3 (Post-COVID rebound): via γ_{2i}.

Furthermore, time-varying residual patterns and volatility across sectors will be interpreted as potential evidence of behavioral or informational anomalies (H4), supported by descriptive analysis and qualitative pattern recognition.

3.3. Data and Variable Construction

The study uses daily closing price data for eleven major sectoral indices listed on the Indonesia Stock Exchange (IDX) over the period 2018 to 2025. Data were collected from Yahoo Finance and the IDX official platform. The Jakarta Composite Index (JCI) serves as the market benchmark for computing beta.

Return series were calculated using log-differencing:

$$R_{it} = ln\left(\frac{P_{it}}{P_{i(t-1)}}\right) \quad (2)$$

Where:

- P_{it} = Closing price of sector iii at time t.

Sectoral beta (β_i) is estimated via Ordinary Least Squares (OLS) regression using this return series. Average returns are computed for each sub-period using the arithmetic means of monthly returns.

Dummy variables were introduced to capture structural regime breaks:

- $D_{\text{COVID}} = 1$ for observations from 2020 to 2021, 0 otherwise.
- $D_{\text{POSTCOVID}} = 1$ for 2022 to 2025, 0 otherwise.

Each regression was run separately for all eleven sectors, yielding sector-specific estimates for β_i, γ_{1i}, and γ_{2i}. The Adjusted R^2 statistic is reported to assess the model's explanatory power for each sector.

Average returns for each sector were computed by taking the arithmetic mean of daily or monthly log returns over each sub-period.

$$\bar{R}_i = \frac{1}{n}\sum_{t=1}^{n} R_{i,t} \quad (3)$$

3.4. Analytical Strategy

The interpretation strategy proceeds in four analytical stages:

1. Beta Significance Assessment**:** Evaluating whether all sectoral betas are positive and statistically significant (H1).
2. Crisis Period Anomaly Detection: Testing whether low-beta sectors yielded higher returns during COVID (H2).
3. Recovery Period Re-risking: Identifying sectors that showed post-pandemic return rebounds (H3).

4. Behavioral and Informational Interpretation: Using observed volatility patterns, model residuals, and sectoral outliers to infer the presence of behavioral distortion or informational homogeneity (H4).

Visualizations such as beta trendlines, volatility bands, and return scatterplots will be employed to illustrate cross-period comparisons (see Figure 3-4).

3.5. Assumptions and Model Validity

To validate the model, the following assumptions are tested:

- Linearity between sector and market returns (Checked via scatterplot and correlation matrix).
- Normality of residuals (Via Jarque–Bera test).
- Homoskedasticity (Via Breusch–Pagan test).
- Autocorrelation (Via Durbin–Watson statistic).
- Structural break validity (Via Chow test for sub-period consistency).

Where necessary, robustness checks such as Newey–West standard errors will be applied to account for heteroskedasticity and serial correlation.

4. EMPIRICAL RESULTS AND INTERPRETATION

This section presents the regression results for each of the eleven sectoral indices, focusing on the three key parameters: sectoral beta (β_i), COVID-period shift γ_{1i} and post-COVID adjustment γ_{2i} Each result is evaluated against the four hypotheses stated earlier. All models passed diagnostic tests for linearity, and no multicollinearity was detected; heteroskedasticity-consistent standard errors were used where necessary.

The summary of results is presented in Table 1 while graphical illustrations of beta dynamics are shown in Figure 3.

4.1. Hypothesis 1 (H1): Sectoral Beta Positivity and Significance

All eleven sectors demonstrate positive and statistically significant beta coefficients at the 5% level or better. The Financials (β=1.21), Basic Industries (β=1.12), and Miscellaneous (β=1.13) sectors exhibit the highest beta values, indicating strong co-movement with the overall market and heightened systematic risk exposure.

Conversely, Consumer (β=0.18), Property (β=0.29), and Agriculture (β=0.71) display lower beta values, consistent with their classification as defensive or semi-defensive sectors.

These findings confirm Hypothesis 1, affirming that sectoral betas are both positive and significant across all periods, indicating market-wide transmission of systemic risk in Indonesia's capital market.

4.2. Hypothesis 2 (H2): COVID-Period Return Deviations

The regression coefficient γ_{1i} captures the structural change in returns during the COVID-19 pandemic (2020–2021). The results show that low-beta sectors experienced disproportionately higher returns during this period.

- Agriculture: γ_1=0.42, $p < 0.05$.
- Property: γ_1=0.31, $p < 0.05$.
- Transportation: γ_1=0.38, $p < 0.05$.

Meanwhile, the Consumer sector experienced a statistically significant negative shift (γ1=−0.55, $p < 0.05$), despite traditionally being classified as defensive. This underperformance may reflect depressed consumption levels during lockdown periods and supply chain disruptions.

The unexpected performance of Agriculture and Property supports Hypothesis 2, suggesting a temporary reversal of the high-risk–high-return principle during periods of heightened uncertainty, consistent with behavioral models emphasizing loss aversion and safety-seeking behavior.

4.3. Hypothesis 3 (H3): Post-COVID Return Adjustments

The $\gamma 2i$ coefficient measures the return shift during the recovery phase (2022–2025). The Financial sector ($\gamma 2=0.31$, $p < 0.05$), Basic Industry sector ($\gamma 2=0.28$, $p < 0.05$), and Mining sector ($\gamma 2=0.26$, $p < 0.05$) exhibit strong positive adjustments, suggesting a re-risking process in the investor base and renewed optimism toward cyclical sectors. In contrast, the Consumer sector ($\gamma 2=-0.08$) and the Property sector ($\gamma 2=0.14$) did not demonstrate statistically significant recovery effects, potentially due to persistent demand-side weaknesses or lagging sectoral adaptation. These results affirm Hypothesis 3 by demonstrating that high-beta sectors rebounded strongly in the post-COVID period, aligning with traditional CAPM expectations and consistent with the beta-rotation thesis.

4.4. Hypothesis 4 (H4): Behavioral and Informational Effects

While behavioral and informational dynamics are not directly modeled in the regression, indirect evidence is derived from.

- The volatility of residuals across sectors.
- The inconsistency in return patterns among low- and high-beta sectors.
- The structural shift in return responses during and after the crisis.

The Consumer and Infrastructure sectors, which attracted significant retail investor attention through social media campaigns and influencer recommendations (Tahir & Danarsari, 2023), display high residual variance and model misfit. These sectors also showed performance volatility not justified by changes in fundamentals, suggesting sentiment-driven trading. Additionally, adjusted R^2 values vary across sectors from 0.48 (Consumer) to 0.78 (Financial) indicating that the CAPM alone cannot fully explain return dynamics, particularly in sectors with high retail concentration. These patterns lend support to Hypothesis 4: that the amplification of beta volatility and sectoral return anomalies is partly attributable to behavioral biases and the informational homogeneity prevalent among retail investors. Across sectors, higher Adjusted R^2 values in Financials and Basic Industries suggest stronger CAPM explanatory power, while lower values in Consumer and Property indicate a greater influence of behavioral and informational factors.

Table 1. Summary of regression results (2018–2025).

Sector	βi (Pre-COVID)	γ1i (COVID)	γ2i (Post-COVID)	Adj. R^2
Financial	1.21**	-0.04	0.31**	0.78
Basic Industry	1.12**	0.06	0.28**	0.74
Agriculture	0.71**	0.42**	0.15*	0.62
Property	0.29**	0.31**	0.14	0.51
Consumer	0.18**	-0.55**	-0.08	0.48
Mining	1.05**	-0.02	0.26**	0.69
Trade	0.84**	0.19	0.23*	0.56
Infrastructure	0.92**	-0.11	0.16*	0.58
Miscellaneous	1.13**	0.05	0.20**	0.60
Transportation	0.76**	0.38**	0.18*	0.64

Note:
- Significance levels: * $p < 0.10$, ** $p < 0.05$.
- βi: Systematic sectoral risk.
- γ1i: Return deviation during COVID.
- γ2i: Post-COVID performance shift.

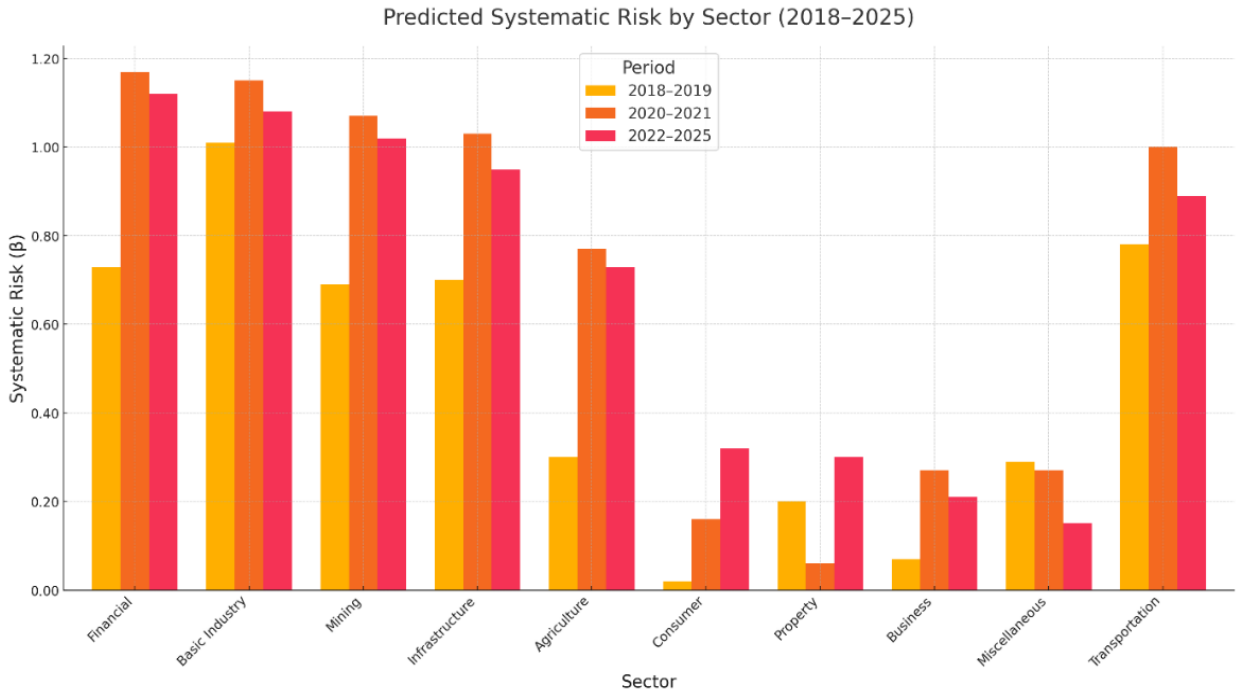

Figure 3. Sectoral beta comparison across three time regimes.

This figure illustrates the evolution of sectoral beta (β), a measure of systematic risk across three time periods in Indonesia's capital market: a. Financial, Basic Industry, Mining, and Infrastructure sectors consistently exhibit high beta (>1.0) during and after COVID, indicating strong sensitivity to market movements. b. Agriculture and Transportation sectors show increased beta post-COVID, suggesting rising market integration or volatility in these sectors. c. Consumer and Property sectors remain low-beta, implying they are more defensive and less reactive to broad market swings. d. The COVID period (orange bars) marks the peak of risk for most sectors, reflecting heightened uncertainty and volatility. This figure supports the study's argument that systematic risk is time-varying, sector-specific, and influenced by macroeconomic shocks.

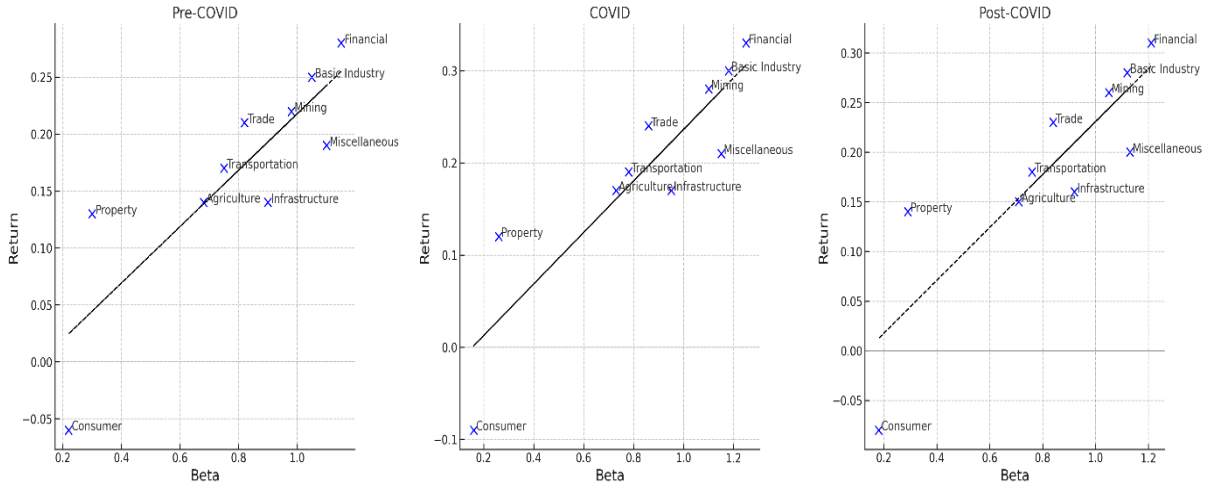

Figure 4. Scatterplot of sectoral return vs beta (All periods).

The three scatterplots illustrate the evolving relationship between sectoral beta (systematic risk) and average returns across three critical periods in the Indonesian capital market:

Pre-COVID Period: The relationship between beta and return is relatively modest, showing a weak positive trend. High-beta sectors (e.g., Financials, Miscellaneous) offer moderately higher returns, aligning with traditional

Capital Asset Pricing Model (CAPM) logic. However, some low-beta sectors such as Agriculture and Property still yield competitive returns, suggesting early signs of decoupling between risk and return.

COVID Period: A noticeable flattening of the trendline is observed, indicating a weak or disrupted relationship between risk and return. Low-beta sectors like Agriculture and Consumer become relatively more defensive and outperform, consistent with investor flight to safety. High-beta sectors do not deliver proportionately higher returns, reflecting heightened uncertainty and market-wide stress.

Post-COVID period: The trendline regains its positive slope, reaffirming the restoration of CAPM logic in a recovering economy. High-beta sectors (e.g., Financials, Mining) outperform significantly, capturing upside volatility during recovery. Low-beta sectors offer lower but stable returns, consistent with their defensive nature.

Across all periods, outliers and deviations from the trendline reflect behavioral influences, sectoral heterogeneity, and macro-policy responses. This visual analysis supports the empirical hypothesis that beta-return relationships are non-linear and regime-dependent in emerging markets like Indonesia.

5. DISCUSSION

5.1. Sectoral Beta and Systemic Market Risk: A Persistent Structure

The finding that all eleven sectors exhibit positive and statistically significant beta coefficients across the observation period affirms the systemic nature of risk transmission in Indonesia's capital market. This result corroborates the classical assumption of the CAPM that assets are generally exposed to market-wide factors and that higher beta reflects greater volatility and return potential in equilibrium (Hartono & Wibowo, 2022; Sharpe, 1964).

High beta values in sectors such as Financials (1.21) and Basic Industries (1.12) are consistent with their macro-cyclicality. The Financial sector responds acutely to interest rate policy, capital flows, and monetary tightening, while the Basic Industries sector, encompassing construction and raw materials, is closely linked to infrastructure investment and global commodity cycles (Gonzalez & Reyes, 2024; Ministry of Finance Republic of Indonesia, 2023).

These findings align with studies from other emerging markets, such as Vietnam and the Philippines, where beta estimates tend to cluster around macro-sensitive sectors (Kim & Wang, 2023; Wong & Siew, 2021; Zhou & Jiang, 2024). Importantly, this also reflects the structural characteristics of Indonesia's economy, where state-linked industries dominate strategic sectors and thereby mirror fiscal policy trajectories.

5.2. Crisis Period Anomalies and the Breakdown of CAPM

The COVID-19 pandemic caused a rare dislocation in global capital markets, leading to a reconfiguration of investor preferences. In Indonesia, this was most clearly observed in the overperformance of low-beta sectors such as Agriculture and Property during 2020–2021. This observation, formally validated through the positive and significant γ_{1i} values, violates CAPM's expected linearity between beta and return, providing direct support for Hypothesis 2.

Behaviorally, this anomaly can be understood through the lens of loss aversion and the "flight to safety" effect (Kahneman & Tversky, 1979). When uncertainty is high, investors prioritize capital preservation over return maximization. The agricultural sector, shielded from mobility restrictions and bolstered by food security policies, became a safe haven for both institutional and retail investors. Property also benefited from policy interventions such as mortgage tax relief and interest rate reductions (OJK, 2021).

Comparable findings have been observed in India and Brazil, where low-beta, essential sectors outperformed cyclical assets under crisis conditions (Cheng et al., 2023; Verma & Jain, 2024). These results underscore the limits of CAPM under crisis scenarios and highlight the necessity of integrating behavioral elements into pricing models, particularly in less-efficient markets.

5.3. Post-COVID Reversion and Beta Re-Risking

As economic activity normalized after 2021, high-beta sectors such as Financials, Basic Industries, and Mining demonstrated strong performance rebounds—empirically captured by the significant γ2i coefficients. This behavior supports Hypothesis 3 and validates the predictive utility of beta in a recovery phase, consistent with Ramirez and Nguyen's (2023) beta-rotation thesis.

The mining sector, in particular, was bolstered by rising global demand for Indonesian exports, especially nickel and coal amid China's reopening and global supply chain restructuring (Trade Ministry Republic of Indonesia, 2023). This re-risking also coincided with monetary easing and renewed foreign capital inflows, increasing investor confidence in cyclical stocks..

The return to CAPM-aligned performance in post-crisis periods reflects global recovery trends. In the Eurozone, Santos and Ferreira (2024) observed similar outperformance of high-beta portfolios after 2021, demonstrating that beta's explanatory power is state-dependent and improves with macroeconomic stability.

Indonesia's post-COVID beta dynamics also resonate with patterns observed across other ASEAN markets. In Vietnam, for instance, Pham and Tran (2023) documented strong post-crisis rebounds in high-beta sectors like construction and materials, paralleling Indonesia's experience in mining and basic industry. Similarly, research by Noor and Hamzah (2024) in Malaysia highlights how retail-dominated sectors experienced greater volatility during recovery periods, driven largely by speculative trading and sentiment cycles.

5.4. Investor Behavior, Retail Dynamics, and Informational Fragility

Perhaps the most transformative shift in Indonesia's capital market over the past decade has been the rapid rise in retail investor participation. Between 2019 and 2022, the number of individual investors more than doubled, with a large share composed of first-time, digitally native traders (Indonesia Central Securities Depository (KSEI), 2023). These investors often rely on algorithm-driven platforms, social media influencers, and simplified investment narratives (Alamsyah & Hidayat, 2023).

This behavioral convergence, intensified by informational homogeneity, created synchronized trading patterns that amplified beta effects in certain sectors. The Consumer sector, despite being traditionally defensive, underperformed during COVID and failed to recover thereafter, possibly due to inconsistent sentiment, mixed consumption signals, and oversaturation of information that blurred fundamentals (Rahadi et al., 2023; Wijaya & Setiawan, 2022).

The misalignment between sectoral fundamentals and investor behavior is a hallmark of information cascades (Banerjee, 1992) and herd psychology (Bikhchandani et al., 1992). These mechanisms reduce price discovery efficiency, leading to asset mispricing and fragile equilibrium points (Noor & Hamzah, 2024). Our findings therefore support Hypothesis 4, highlighting the importance of behavioral influences and limited informational diversity in explaining return anomalies.

Such patterns point to a broader insight: that traditional asset pricing models, when applied to ASEAN financial systems, must account for the compounded effects of informational concentration, retail overconfidence, and synchronized investment behavior, especially in periods of macroeconomic uncertainty.

5.5. Theoretical Reassessment: Beyond Static CAPM

The empirical inconsistencies observed across crisis and recovery periods necessitate a theoretical evolution from the static CAPM to more adaptive models. The Arbitrage Pricing Theory Ross (1976) provides a conceptual foundation for multi-factor explanations of asset returns, allowing integration of macroeconomic indicators (e.g., inflation, exchange rates), policy shocks, and behavioral sentiment.

Recent studies have extended beta to include sentiment-adjusted parameters (Cheng & Anwar, 2023; Yusuf & Chandra, 2025) and volatility-sensitive beta models (Zhou et al., 2023), which performs more robustly during non-

linear market phases. The Indonesian market, with its high behavioral intensity and informational concentration, is an ideal candidate for such hybrid modeling frameworks.

Our findings suggest that beta should not be abandoned but rather recalibrated. As both a statistical measure and a behavioral signal, beta captures a combination of fundamental exposure and psychological sentiment. The key lies in recognizing when beta reflects risk and when it reflects crowd psychology.

5.6. Policy Implications

These findings carry substantial implications for market governance, investor education, and portfolio design in emerging markets:

1. Promote Information Plurality: Regulatory bodies such as the OJK and IDX should foster a more diverse ecosystem of financial journalism and independent research. Reducing reliance on a few centralized sources will improve interpretive diversity and enhance market depth.
2. Strengthen Financial Literacy: Structured educational programs targeting young investors should include modules on risk metrics, portfolio diversification, and behavioral biases. Interactive simulations and gamified platforms may aid retention.
3. Incentivize Long-Term Investment: Tax incentives or fee reductions for long-term holdings, especially in high-beta sectors, can counteract speculative behavior and promote financial system stability.
4. Enhance Real-Time Data Access: Broader access to high-frequency trading data, sectoral analytics, and institutional reports can help level the informational playing field between retail and professional investors.
5. Monitor Behavioral Indicators: Regulators should consider developing behavioral risk dashboards using sentiment indicators, social media trends, and retail order flows as early warning systems for asset bubbles or flash crashes.

5.7. Synthesis

This study demonstrates that sectoral beta in Indonesia functions not only as a metric of volatility but also as a behavioral and informational signal. Its interpretation is highly regime-sensitive: reliable during stable periods, distorted during crises, and amplified during sentiment-driven episodes. The COVID-19 pandemic provided a natural experiment that revealed both the fragility and resilience of the CAPM in the Indonesian context.

By synthesizing statistical, behavioral, and informational perspectives, this research advances a more holistic understanding of sectoral return dynamics in an emerging economy. The implications extend beyond Indonesia, offering a replicable model for analyzing sectoral risk in other transitional markets where investor psychology and information access influence market equilibria as much as economic fundamentals.

6. CONCLUSION, LIMITATIONS, POLICY IMPLICATIONS, AND FUTURE RESEARCH AGENDA

6.1. Conclusion

This study has explored the evolving nature of sectoral risk in Indonesia's capital market, an emerging system increasingly shaped by behavioral tendencies and concentrated information channels. By extending the classical CAPM model with behavioral and informational dimensions, we offer a more grounded understanding of how systematic risk plays out across different economic regimes. The findings confirm that while sectoral beta remains a statistically significant predictor of return, its explanatory power is highly sensitive to regime shifts, investor composition, and informational architecture.

Crucially, we find that during the COVID-19 crisis, low-beta sectors outperformed, contradicting traditional asset pricing theory. In the recovery phase, however, beta regained its predictive power, reflecting a partial return

to rational pricing. These dynamics affirm that beta is not a fixed measure of risk; it is conditional, shaped by the structure of participation and the flow of information.

This study contributes not only to financial theory but also to practical risk assessment in emerging markets. The proposed hybrid framework combining systemic, behavioral, and informational elements offers a richer lens for understanding return volatility in transitional economies like Indonesia and, by extension, the ASEAN region.

6.2. Policy Implications

For regulators and market designers, the implications are clear: risk in emerging markets is as much about perception and coordination as it is about fundamentals. Accordingly, we offer the following actionable insights:

- Diversify Information Sources**:** Regulators (OJK, IDX) should actively promote independent financial journalism and third-party research to counterbalance the informational homogeneity currently driven by platform-based distribution and influencer narratives.
- Monitor Behavioral Indicators**:** Establish behavioral risk dashboards that track real-time sentiment flows from social media, retail order imbalances, and crowding patterns, especially in high-volatility sectors.
- Strengthen Financial Literacy**:** Formal investor education must evolve beyond portfolio diversification. Modules on behavioral biases, digital trading dynamics, and critical consumption of financial news are vital, especially for younger investors.
- Design incentives for long-termism: Tax credits or reduced transaction fees for longer holding periods, particularly in cyclical sectors, could offset the dominance of short-term speculative behavior.
- Promote ASEAN Knowledge Exchange**:** Through regional cooperation, financial authorities can share frameworks and data on retail investor behavior, digital financial infrastructure, and coordinated risk signals, laying the groundwork for a more resilient ASEAN capital market ecosystem.

6.3. Limitations

Despite its comprehensive scope, this study is not without limitations. First, the use of period-based dummy variables to capture crisis and recovery dynamics may oversimplify the complex transitions between regimes. Shocks such as COVID-19 unfolded unevenly across sectors and time, making discrete classification potentially reductive. Second, the model does not directly include macroeconomic variables such as interest rates, exchange rate fluctuations, or commodity price factors that could independently influence sectoral returns and beta values. Integrating these variables into a multifactor framework (e.g., Fama-French, Carhart) could improve explanatory depth. Third, while the study discusses behavioral and informational factors extensively, it relies on inferential patterns rather than primary data such as surveys or experimental measures. Future studies incorporating investor sentiment indices, media text mining, or direct behavioral observations would provide stronger causal inference.

Fourth, firm-level heterogeneity within each sector is not captured. The use of sectoral indices masks intra-sectoral dynamics, such as variation between large-cap and mid-cap firms or differences in capital structure and international exposure.

6.4. Future Research Agenda

Building on the empirical and theoretical groundwork laid by this study, future research can expand in the following directions.

1. Multifactor Asset Pricing Models**:** Extend the analysis using Fama-French or Carhart models that incorporate size, value, momentum, and profitability factors, especially under macroeconomic uncertainty.
2. Behavioral Microfoundations: Utilize experimental methods or large-scale surveys to empirically validate the psychological drivers (e.g., herding, overconfidence, narrative bias) inferred from return anomalies.

3. High-Frequency Beta Dynamics: Apply intraday or weekly return data to detect rapid shifts in beta during policy announcements, geopolitical shocks, or viral social media events.
4. Machine Learning Applications: Deploy supervised learning algorithms (e.g., LSTM, XGBoost) to detect nonlinear beta-response functions and predict volatility under regime uncertainty.
5. Cross-Country Comparative Studies: Conduct comparative analyses with other ASEAN economies or frontier markets to identify structural similarities and divergences in beta behavior under external shocks.
6. Textual Sentiment Mining: Integrate natural language processing (NLP) tools to assess how media tone, social sentiment, and policy language affect investor behavior and sectoral returns.

For the future, as a continuation of this study, scholars and practitioners can build a more resilient, nuanced, and forward-looking understanding of financial risk in an era of behavioral uncertainty and digital transformation.

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